

# Nano-Scale ZnO Coating for Reduction of Biofilm Formation, Phase I

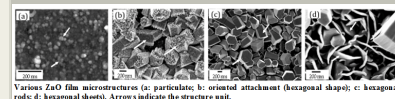
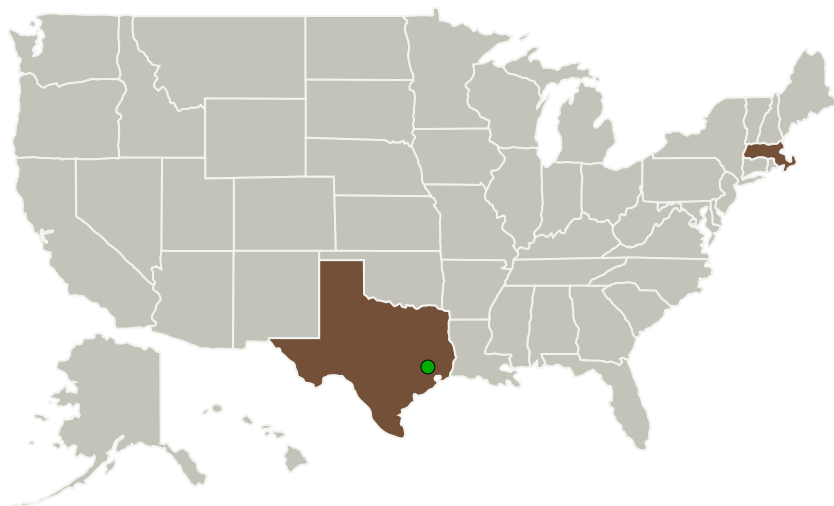
Completed Technology Project (2016 - 2016)



## Project Introduction

The proposed program will develop a ceramic coating with surface features, ranging from nanometer to micrometer size-scale, that will be optimized to prevent the attachment of biofilm-forming bacteria found in wastewater plumbing in life support systems in space. The coating technology offers several advantages compared to presently available processes, including low temperature deposition, a range of surface feature sizes, strong adhesion, and no toxic waste products. Phase I will deposit the anti-microbial coating on metallic and polymer samples of materials typical of those in the International Space Station (ISS), measure the mechanical and physical characteristics of the coatings, and compare bacterial and biofilm formation rate with uncoated controls. The coating with the greatest anti-microbial activity will also be demonstrated on the interior surface of tubing sections of the same ISS materials. If Phase I is successful, Phase II would expand testing to other biofilm-forming bacterial types and to other organic materials found in wastewater piping, and demonstrate coating deposition on realistic-size plumbing configurations. Phase II would also initiate intellectual property protection and develop partnerships for NASA and commercial applications. Phase III of the proposed program would see strong commercialization efforts, both in-house and through external licensing agreements.

## Primary U.S. Work Locations and Key Partners



Nano-scale ZnO coating for reduction of biofilm formation, Phase I

## Table of Contents

|  |   |
|--|---|
| Project Introduction                         | 1 |
| Primary U.S. Work Locations and Key Partners | 1 |
| Project Transitions                          | 2 |
| Images                                       | 2 |
| Organizational Responsibility                | 2 |
| Project Management                           | 2 |
| Technology Maturity (TRL)                    | 2 |
| Technology Areas                             | 3 |
| Target Destinations                          | 3 |

## Nano-Scale ZnO Coating for Reduction of Biofilm Formation, Phase I



Completed Technology Project (2016 - 2016)

| Organizations Performing Work | Role                    | Type        | Location               |
|-------------------------------|-------------------------|-------------|------------------------|
| N2 Biomedical, LLC            | Lead Organization       | Industry    | Bedford, Massachusetts |
| ● Johnson Space Center(JSC)   | Supporting Organization | NASA Center | Houston, Texas         |

## Primary U.S. Work Locations

|               |       |
|---------------|-------|
| Massachusetts | Texas |
|---------------|-------|

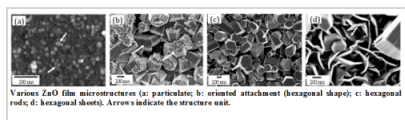
## Project Transitions

**June 2016:** Project Start**December 2016:** Closed out

## Closeout Documentation:

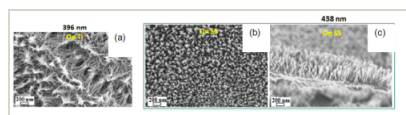
- Final Summary Chart(<https://techport.nasa.gov/file/139609>)

## Images



## Briefing Chart Image

Nano-scale ZnO coating for reduction of biofilm formation, Phase I

(<https://techport.nasa.gov/image/128770>)

## Final Summary Chart Image

Nano-scale ZnO coating for reduction of biofilm formation, Phase I Project Image

(<https://techport.nasa.gov/image/136561>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

N2 Biomedical, LLC

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

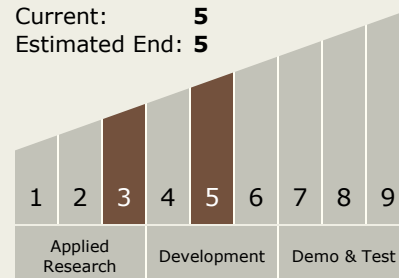
Arash Aslani

## Technology Maturity (TRL)

Start: 3

Current: 5

Estimated End: 5



# Nano-Scale ZnO Coating for Reduction of Biofilm Formation, Phase I

Completed Technology Project (2016 - 2016)



## Technology Areas

### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - └ TX06.1.2 Water Recovery and Management

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System